AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1.   (Original)   A method of estimating a state of charge (SOC) and a state of health (SOH) of an electrochemical cell (EC), comprising:

modeling said EC with a linear equation;

measuring a terminal current of said EC;

measuring a terminal voltage of said EC;

measuring a temperature of said EC; and

processing said linear equation through a time-varying state and parameter estimator based on said terminal current, said terminal voltage and said temperature to determine states and parameters of said EC.

2.   (Original)   The method of claim 1 wherein said states include said SOC and ohmic resistance of said EC.

3.   (Original)   The method of claim 1 wherein said parameters include a variable, a charge variable and a discharge variable of said EC.

4.   (Original)   The method of claim 3 further comprising determining said SOH based on said variable, said charge variable and said discharge variable.

5.   (Original)   The method of claim 1 wherein said linear equation is a process model that models changes in states and parameters of said EC based on current.

6.   (Original)   The method of claim 1 further comprising determining synthesized inputs based on said terminal current, said terminal voltage and said temperature wherein said processing is further based on said synthesized inputs.

7.   (Original)   The method of claim 1 wherein said step of processing said linear equation comprises:

        predicting current states based on prior states;

        predicting current error of said states based on prior errors of said states;

        determining current state gains based on said current error of said states; and

        updating said current states based on said prior states and said current state gains to provide said states of said EC.

8.   (Original)   The method of claim 7 wherein said states include said SOC and ohmic resistance of said EC.

9.   (Original)   The method of claim 7 wherein said state errors are continuously updated.

10.   (Original)   The method of claim 1 wherein said step of processing said linear equation comprises:

predicting current parameters based on prior parameters;

predicting current error of said parameters based on prior errors of said parameters;

determining current parameter gains based on said current error of said parameters; and

updating said current parameters based on said prior parameters and said current parameter gains to provide said parameters of said EC.

11.   (Original)   The method of claim 10 wherein said parameters include a variable, a charge variable and a discharge variable of said EC.

12.   (Original)   The method of claim 10 wherein said parameter errors are continuously updated.

13.   (Original)   A method of estimating states and parameters of an electrochemical cell (EC), comprising:

modeling said EC with a linear equation;

measuring a terminal current of said EC;

measuring a terminal voltage of said EC;

measuring a temperature of said EC;

determining initial states and initial parameters; and

processing said linear equation through a Kalman filter (KF)-based state and parameter estimator based on said terminal current, said terminal voltage, said

temperature, said initial states and said initial parameters to determine said states and said parameters.

14. (Original)   The method of claim 13 wherein said states include a state of charge (SOC) and ohmic resistance of said EC.

15. (Original)   The method of claim 13 wherein said parameters include a variable, a charge variable and a discharge variable of said EC.

16. (Original)   The method of claim 15 further comprising determining a state of health (SOH) based on said variable, said charge variable and said discharge variable.

17. (Original)   The method of claim 13 wherein said linear equation is a process model that models changes in said states and parameters of said EC based on current.

18. (Original)   The method of claim 13 further comprising determining synthesized inputs based on said terminal current, said terminal voltage and said temperature wherein said processing is further based on said synthesized inputs.

19. (Original)   The method of claim 13 wherein said step of processing said linear equation comprises:

predicting current states based on prior states;

predicting current error of said states based on prior errors of said states;

determining current state gains based on said current error of said states; and

updating said current states based on said prior states and said current state gains to provide said states of said EC.

20. (Original) The method of claim 19 wherein said states include a state of charge (SOC) and ohmic resistance of said EC.

21. (Original) The method of claim 19 wherein said state errors are continuously updated.

22. (Original) The method of claim 13 wherein said step of processing said linear equation comprises:

predicting current parameters based on prior parameters;

predicting current error of said parameters based on prior errors of said parameters;

determining current parameter gains based on said current error of said parameters; and

updating said current parameters based on said prior parameters and said current parameter gains to provide said parameters of said EC.

23. (Original) The method of claim 22 wherein said parameters include a variable, a charge variable and a discharge variable of said EC.

24. (Original) The method of claim 22 wherein said parameter errors are continuously updated.

25. (Original) The method of claim 13 wherein said initial states and parameters are determined based on minimizing an initial error between said initial states and parameters and actual states and parameters.

26. (Original) A method of estimating states and parameters of an electrochemical cell (EC), comprising:

modeling said EC with a linear equation based on characterization data of said EC;

measuring a terminal current of said EC;

measuring a terminal voltage of said EC;

measuring a temperature of said EC; and

processing said linear equation through a Kalman filter (KF)-based state and parameter estimator based on said terminal current, said terminal voltage, said temperature to determine said states and said parameters.

27. (Original) The method of claim 26 wherein said characterization data includes the rate of change of a parameter based on a state.